CONTENTS

VOLUME 56 NUMBER 1 JULY 1992

Articles

Witold Korytowski, Gary J. Bachowski and Albert W. Girotti — 1 Photoperoxidation of cholesterol in homogeneous solution, isolated membranes, and cells: comparison of the 5α- and 6β-hydroperoxides as indicators of singlet oxygen intermediacy

R. O. Rahn — 9 Photochemistry of halogen pyrimidines: iodine release studies

Ferran Garcia-Pichel, Nelson D. Sherry and Richard W. Castenholz — 17 Evidence for an ultraviolet sunscreen role of the extracellular pigment scytonemin in the terrestrial cyanobacterium *Chlorogloeopsis* sp.

H. L. Gensler, P. J. Simpson and M. Broome Powell — 25 Inhibition of 12-*O*-tetradecanoylphorbol-13-acetate-induced tumor promotion in murine skin by systemic effects of ultraviolet irradiation

Masayasu Sugiyama, Katsuyuki Tsuzuki, Kumi Matsumoto and Ryobei Ogura — 31 Effect of vitamin E on cytotoxicity, DNA single strand breaks, chromosomal aberrations, and mutation in Chinese hamster V-79 cells exposed to ultraviolet-B light

J. D. Regan, W. L. Carrier, H. Gucinski, B. L. Olla, H. Yoshida, R. K. Fujimura and R. I. Wicklund — 35 DNA as a solar dosimeter in the ocean

Rajesh Agarwal, Mohammad Athar, Craig A. Elmets, David R. Bickers and Hasan Mukhtar — 43 Photodynamic therapy of chemically- and ultraviolet B radiation-induced murine skin papillomas by chloroaluminum phthalocyanine tetrasulfonate

David Kessel, K. Lane Whitcomb and Veronique Schulz — 51 Lipoprotein-mediated distribution of *N*-aspartyl chlorin-E6 in the mouse

Ulrich M. Ganter, Triantaphyllia Charitopoulos, Noelle Virmaux and Friedrich Siebert — 57 Conformational changes of cytosolic loops of bovine rhodopsin during the transition to metarhodopsin-II: an investigation by Fourier transform infrared difference spectroscopy

Chang Sook Kim and Jin Jung — 63 Iron–sulfur centers as endogenous blue light sensitizers in cells: a study with an artificial non-heme iron protein

Junko Takeda and Shunnosuke Abe — 69 Light-induced synthesis of anthocyanin in carrot cells in suspension—IV. The action spectrum

Janny L. Peters, Mariëlle E. L. Schreuder, Sebastiaan J. W. Verduin and Richard E. Kendrick — 75 Physiological characterization of a high-pigment mutant of tomato

Ksenija Radotić, Milorad Jeremić and Čedomir Radenović — 83 Kinetic study of stress-induced luminescence from different tissues

Toshiyuki Nagoshi, Nobuyuki Watanabe, Sohkichi Suzuki, Masashi Usa, Haruo Watanabe, Tsutomu Ichimura and Humio Inaba — 89 Spectral analyses of low level chemiluminescence of a short lifetime using a highly sensitive polychromatic spectrometer incorporating a two dimensional photon-counting type detector

Research Notes

C.-R. Huang and S. Georghiou — 95 Room-temperature steady-state fluorescence properties of poly(dG-dC)·poly(dG-dC)

Leticia U. Colmenares and Robert S. H. Liu — 101 9,11-Di*cis*-12-fluororhodopsin. Chromophore properties from ^{19}F-NMR studies

Technical Notes

Masayuki Masuko, Takuji Kataoka, Norikazu Sugiyama, Shigeru Uchiyama, Hirofumi Sugiyama, Katsunori Tarui, Kiyoshi Kamiya and Tohru Kawai — 107 A photon counting TV camera equipped with an image guide for rapid detection and counting of single bacteria in a wide field

John E. Frederick — 113 An assessment of the Robertson–Berger ultraviolet meter and measurements: introductory comments

John DeLuisi, James Wendell and Fred Kreiner 115 An examination of the spectral response characteristics of seven Robertson–Berger meters after long-term field use

John E. Frederick and Elizabeth C. Weatherhead 123 Temporal changes in surface ultraviolet radiation: a study of the Robertson–Berger meter and Dobson data records

Brian C. Kennedy and William E. Sharp 133 A validation study of the Robertson–Berger meter

Book Review 143

VOLUME 56 NUMBER 2 AUGUST 1992

Obituary III

Articles

Francis D'Souza and V. Krishnan 145 Inter and intramolecular interactions of porphyrins with 5,5′-dithiobis(2-nitrobenzoic acid)

Lydia N. Raser, Stephen V. Kolaczkowski and Therese M. Cotton 157 Resonance Raman and surface-enhanced resonance Raman spectroscopy of hypericin

M. Amin Abubaker and Ray Von Wandruszka 163 A new fluorescent cholesterol derivative: structure and blood plasma analysis

Johan Moan, Kristian Berg, Jerry C. Bommer and Andre Western 171 Action spectra of phthalocyanines with respect to photosensitization of cells

Kristian Berg, Kari Madslien and Johan Moan 177 Retention and phototoxicity of tetra(4-sulfonatophenyl)porphine in cultivated human cells. The effect of fractionation of light

Jacques Kagan, Xinsheng Chen, Tian P. Wang and P. Forlot 185 Psoralens cleave pBR322 DNA under ultraviolet radiation

Homer S. Black, John I. Thornby, Janette Gerguis and Wanda Lenger 195 Influence of dietary omega-6, -3 fatty acid sources on the initiation and promotion stages of photocarcinogenesis

Isaf Al-Nabulsi and Peter L. Gutierrez 201 Photosensitization of MCF-7 cells with diaziquone using visible light: correlation with DNA strand breaks and free radical production

Archana Asthana, Richard A. Larson, Karen A. Marley and R. W. Tuveson 211 Mechanisms of citral phototoxicity

N. Kollias, A. Baqer, I. Sadiq and R. M. Sayre 223 *In vitro* and *in vivo* ultraviolet-induced alterations of oxy- and deoxy-hemoglobin

Leith Holloway 229 Atmospheric sun protection factor on clear days: its observed dependence on solar zenith angle and its relevance to the shadow rule for sun protection

James A. Hampton and Steven H. Selman 235 Mechanisms of cell killing in photodynamic therapy using a novel *in vivo* drug/*in vitro* light culture system

Nobuto Yamamoto, J. Kenneth Hoober, Nobuyuki Yamamoto and Shinji Yamamoto 245 Tumoricidal capacities of macrophages photodynamically activated with hematoporphyrin derivative

Rosalie K. Crouch, E. Starr Hazard, Thomas Lind, Barbara Wiggert, Gerald Chader and D. Wesley Corson 251 Interphotoreceptor retinoid-binding protein and α-tocopherol preserve the isomeric and oxidation state of retinol

J. L. Hott and R. F. Borkman 257 Analysis of photo-oxidized amino acids in tryptic peptides of calf lens γ-II crystallin

R. Picorel, M. Bakhtiari, T. Lu, T. M. Cotton and M. Seibert 263 Surface-enhanced resonance Raman scattering spectroscopy as a surface topography probe in plant photosynthetic membranes

Research Notes

Burchard Franck and Udo Schneider 271 Photooxidation products of merocyanine 540 formed under preactivation conditions for tumor therapy

Kang Qiu, Donald L. Traul and Fritz Sieber 277 Limited cell-cycle dependence of the merocyanine 540-sensitized photoinactivation of L1210 leukemia cells

P. Roschger, B. Devaraj, R. Q. Scott and H. Inaba 281 Induction of a transient enhancement of low level chemiluminescence in intact leaves by anaerobic treatment

Book Review 285

VOLUME 56 NUMBER 3 SEPTEMBER 1992

Notice

III American Society for Photobiology Research Award 1992

Rapid Communication

Celestyn M. Brożek, George M. Shopp, Sharon L. Ryan, Patricia M. Gillespie, Donna F. Kusewitt, M. S. Rajagopalan, Kenneth D. Ley and Ronald D. Ley 287 *In vivo* exposure to ultraviolet radiation enhances pathogenic effects of murine leukemia virus, LP-BM5, in murine acquired immunodeficiency syndrome

PHOTOCHEMISTRY SECTION

Article

V. Ramamurthy, D. R. Sanderson and D. F. Eaton 297 Photophysical probes for monitoring the electric field/micropolarity within the faujasite supercage

PHOTOBIOLOGY SECTION

Articles

R. F. Hartman, S. D. Rose, P. J. W. Pouwels and R. Kaptein 305 Flavin-sensitized photochemically induced dynamic nuclear polarization detection of pyrimidine dimer radicals

A. Das, R. Nandi and M. Maiti 311 Photophysical property of sanguinarine in the excited singlet state

Manuel Hervás, José A. Navarro and Gordon Tollin 319 A laser flash spectroscopy study of the kinetics of electron transfer from spinach Photosystem I to spinach and algal ferredoxins

David L. VanderMeulen, Prabhakar Misra, Jason Michael, Kenneth G. Spears and Mustafa Khoka 325 Laser mediated release of dye from liposomes

Kristian Berg and Johan Moan 333 Mitotic inhibition by phenylporphines and tetrasulfonated aluminium phthalocyanine in combination with light

R. W. Tuveson, Gui-rong Wang and Ralph S. Becker 341 The phototoxicity of 8-methoxythionepsoralen and 6-methylthionecoumarin

Leon A. Bynoe, John D. Gottsch, Sovitj Pou and Gerald M. Rosen 353 Light-dependent generation of superoxide from human erythrocytes

Miao-Lin Hu and Al L. Tappel 357 Potentiation of oxidative damage to proteins by ultraviolet-A and protection by antioxidants

Kanji Ishizaki, Tsukasa Matsunaga, Mitsuo Kato, Osamu Nikaido and Mitso Ikenaga 365 Repair of thymine dimers and (6–4) photoproducts in group A xeroderma pigmentosum cell lines harboring a transferred normal chromosome 9

Gagik G. Gurzadyan and Helmut Görner 371 Base release from DNA and polynucleotides upon 193 nm laser excitation

Qun Chen, Brian C. Wilson, Mary O. Dereski, Michael S. Patterson, Michael Chopp and Fred W. Hetzel 379 Effects of light beam size on fluence distribution and depth of necrosis in superficially applied photodynamic therapy of normal rat brain

Ying Ji, Diana Walstad, J. Tony Brown and Stephen K. Powers 385 Improved survival from intracavitary photodynamic therapy of rat glioma

Mladen Korbelik	391	Cellular delivery and retention of Photofrin: II. The effects of human *versus* mouse and bovine serum
Tatsuomi Matsuoka, Yasunori Murakami, Takahiro Furukohri, Masaki Ishida and Koji Taneda	399	Photoreceptor pigment in *Blepharisma*: H^+ release from red pigment
Research Notes		
Yoshiki Okamoto, Mitsunobu Nakamura, Min Shi and Setsuo Takamuku	403	Formation of intramolecular excimer in aryl phosphates and their reactivities
A. Seret, J. Piette, A. Jakobs and A. Van de Vorst	409	Singlet oxygen quantum yield of sulfur and selenium analogs of psoralen
Technical Notes		
Marvin R. Rich, Ronald de Strulle, Greg Ferraro and Steven S. Brody	413	Dihydroxy-carotenoid liposomes inhibit phototoxicity in *Paramecium caudatum*
Benjamin A. Horwitz, Rivka Amit and Edward D. Lipson	417	A fiber-optic ratio fluorometer for mutant isolation
Corrigendum	421	

VOLUME 56 NUMBER 4 OCTOBER 1992

Rapid Communications		
A. B. Berinstain, J. C. Scaiano, C. Bohne, P. R. L. Malenfant and G. D. Sprott	423	Application of time-resolved diffuse reflectance techniques in studies of reaction intermediates in suspensions of *Bacillus subtilis*
Chandrika Kasturi and Matthew S. Platz	427	Inactivation of lambda phage with 658 nm light using a DNA binding porphyrin sensitizer
Articles		
Jean-Luc Decout and Jean Lhomme	431	Reversible photocycloaddition of a 4′,5′-dihydropsoralen derivative with thymine
Walter C. Eisenberg, Jasbir Anand, Shukun Wang and Robert J. Stevenson	441	Oxidation of phosphatidylcholine membranes by singlet oxygen generated in the gas phase
David Kessel	447	Properties of Cremophor EL micelles probed by fluorescence
Lun-Yi Zang, Bibhu R. Misra and Hara P. Misra	453	Generation of free radicals during photosensitization of Hypocrellin A and their effects on cardiac membranes
S. Rywkin, L. Lenny, J. Goldstein, N. E. Geacintov, H. Margolis-Nunno and B. Horowitz	463	Importance of type I and type II mechanisms in the photodynamic inactivation of viruses in blood with aluminum phthalocyanine derivatives
Anna Atlante, Salvatore Passarella, Giuliana Moreno and Christian Salet	471	Effects of rhodamine 123 in the dark and after irradiation on mitochondrial energy metabolism
Robin J. Marles, James B. Hudson, Elizabeth A. Graham, Chantal Soucy-Breau, Peter Morand, R. Lilia Compadre, Cesar M. Compadre, G. H. Neil Towers and J. Thor Arnason	479	Structure–activity studies of photoactivated antiviral and cytotoxic tricyclic thiophenes
Kang Qiu and Fritz Sieber	489	Merocyanine 540-sensitized photoinactivation of leukemia cells: effects of dose fractionation
Stephen J. Moloney and Douglas B. Learn	495	The effect of systemic cyclosporin A on a hairless mouse model of photoaging

Stephen J. Moloney, Susan H. Edmonds, Lori D. Giddens and Douglas B. Learn 505 The hairless mouse model of photoaging: evaluation of the relationship between dermal elastin, collagen, skin thickness and wrinkles

B. W. Henderson, B. Owczarczak, J. Sweeny and T. Gessner 513 Effects of photodynamic treatment of platelets or endothelial cells *in vitro* on platelet aggregation

Ch. Mohan Rao and J. Samuel Zigler, Jr. 523 Levels of reduced pyridine nucleotides and lens photodamage

W. D. Hoff, S. L. S. Kwa, R. van Grondelle and K. J. Hellingwerf 529 Low temperature absorbance and fluorescence spectroscopy of the photoactive yellow protein from *Ectothiorhodospira halophila*

R. Baraldi, G. Cristoferi, O. Facini and B. Lercari 541 The effect of light quality in *Prunus cerasus*. I. Photoreceptors involved in internode elongation and leaf expansion in juvenile plants

Satoru Tokutomi, Tohru Sugimoto and Mamoru Mimuro 545 A model for the molecular structure and orientation of the chromophore in a dimeric phytochrome molecule

Bing Yan, Steven W. Cline, W. Ford Doolittle and John L. Spudich 553 Transformation of a bop$^-$ hop$^-$ sop-I$^-$ sop-II$^-$ *Halobacterium halobium* mutant to bop$^+$: effects of bacteriorhodopsin photoactivation on cellular proton fluxes and swimming behavior

Research Notes

M. J. Ashwood-Smith, O. Ceska and P. J. Warrington 563 Isopimpinellin is photobiologically inactive

Makoto Oonuki and Masashi Ryuzaki 567 Photon emission during cleavage of frog eggs

VOLUME 56 NUMBER 5 NOVEMBER 1992

PHOTOMORPHOGENESIS IN PLANTS

William J. VanDerWoude and Steven J. Britz VII Introduction

Articles

Jorge J. Casal and Rodolfo A. Sanchez 571 Physiological relationships between phytochrome effects on internode extension growth and dry matter accumulation in light-grown mustard

Michael J. Kasperbauer and Patrick G. Hunt 579 Cotton seedling morphogenic responses to FR/R ratio reflected from different colored soils and soil covers

Alberto L. Mancinelli, Oliver Hobert and George Nikas 585 *In vivo* phytochrome-mediated perception of reflected light signals

Alberto L. Mancinelli, Federica Rossi and Anna Moroni 593 Phytochrome photoconversion *in vivo*. Effect of the initial Pfr/Ptot ratio

Harry Smith and David C. Fork 599 Direct measurement of phytochrome photoconversion intermediates at high photon fluence rates

Harry Smith, Matthew Turnbull and Richard E. Kendrick 607 Light-grown plants of the cucumber long hypocotyl mutant exhibit both long-term and rapid elongation growth responses to irradiation with supplementary far-red light

L. H. J. Kerckhoffs, R. E. Kendrick, G. C. Whitelam and H. Smith 611 Extension growth and anthocyanin responses of photomorphogenic tomato mutants to changes in the phytochrome photoequilibrium during the daily photoperiod

Garry C. Whitelam, Alex C. McCormac, Margaret T. Boylan and Peter H. Quail 617 Photoresponses of *Arabidopsis* seedlings expressing an introduced oat *phyA* cDNA: persistence of etiolated plant type responses in light-grown plants

Anthony Fielding, David N. Kristie and Peter Dearman 623 The temperature dependence of Pfr action governs the upper temperature limit for germination in lettuce

D. Grubišić, Z. Giba and R. Konjević 629 The effect of organic nitrates in phytochrome-controlled germination of *Paulownia tomentosa* seeds

Christian J. Haas, Hannelore Kopp and Robert Scheuerlein	633	Nitrate effect on Pfr-mediated and GA_3-induced germination in spores of *Anemia phyllitidis* (L.) Sw
Paulien Adamse and Steven J. Britz	641	Spectral quality of two fluorescent UV sources during long-term use
Paulien Adamse and Steven J. Britz	645	Amelioration of UV-B damage under high irradiance. I: Role of photosynthesis
Bartolomeo Lercari and Francesco Sodi	651	Photomorphogenic responses to UV radiation. II: A comparative study of UV effects on hypocotyl elongation in a wild-type and an *aurea* mutant of tomato (*Lycopersicon esculentum* Mill.)
Abdul-Kader Janoudi and Kenneth L. Poff	655	Action spectrum for enhancement of phototropism by *Arabidopsis thaliana* seedlings
Jun Hayami, Akeo Kadota and Masamitsu Wada	661	Intracellular dichroic orientation of the blue light-absorbing pigment and the blue-absorption band of the red-absorbing form of phytochrome responsible for phototropism of the fern *Adiantum* protonemata
Alexey V. Sineshchekov and Edward D. Lipson	667	Effect of calcium on dark adaptation in *Phycomyces* phototropism
Friedrich J. Behringer, Peter J. Davies and James B. Reid	677	Phytochrome regulation of stem growth and indole-3-acetic acid levels in the *lv* and *Lv* genotypes of *Pisum*
Sarah M. Assmann, David M. Lee and Per Malkus	685	Rapid stomatal response to red light in *Zea mays*
Kuljeet Guron, Meena R. Chandok and Sudhir K. Sopory	691	Phytochrome-mediated rapid changes in the level of phosphoinositides in etiolated leaves of *Zea mays*
T. Lamparter, P. Lutterbüse, H. A. W. Schneider-Poetsch and R. Hertel	697	A study of membrane-associated phytochrome: hydrophobicity test and native size determination
Yu-Chie Wang, Marie-Michèle Cordonnier-Pratt and Lee H. Pratt	709	Detection and quantitation of three phytochromes in unimbibed seeds of *Avena sativa* L.
J. Bonenberger, R. Schendel, H. A. W. Schneider-Poetsch and W. Rüdiger	717	Structural studies on the photoreceptor phytochrome: reevaluation of the epitope for monoclonal antibody Z-3B1
David L. Farrens, Marie-Michèle Cordonnier, Lee H. Pratt and Pill-Soon Song	725	The distance between the phytochrome chromophore and the N-terminal chain decreases during phototransformation. A novel fluorescence energy transfer method using labeled antibody fragments
Vitally A. Sineshchekov and Wolfhart Rüdiger	735	Fluorescence spectroscopy of stable and labile phytochrome in stems and roots of etiolated cress seedlings
Vitally A. Sineshchekov and Victor V. Akhobadze	743	Phytochrome states in etiolated pea seedlings: fluorescence and primary photoreactions at low temperatures
Sabine Hanelt, Birgit Braun, Stefan Marx and Hansjörg A. W. Schneider-Poetsch	751	Phytochrome evolution: a phylogenetic tree with the first complete sequence of phytochrome from a cryptogamic plant (*Selaginella martensii* Spring)
Helmut P. Maucher, Robert Scheuerlein and Helmut Schraudolf	759	Detection and partial sequence of phytochrome genes in the ferns *Anemia phyllitidis* (L.) Sw. (Schizaeaceae) and *Dryopteris filix-mas* L. (Polypodiaceae) by using polymerase-chain reaction technology
Armin Winands, Gottfried Wagner, Stefan Marx and Hansjörg A. W. Schneider-Poetsch	765	Partial nucleotide sequence of phytochrome from the zygnematophycean green alga *Mougeotia*
Fritz Thümmler, Harald Schuster and Johannes Bonenberger	771	Expression of oat phy*A* cDNA in the moss *Ceratodon purpureus*
Review Articles		
Carlos L. Ballaré, Ana L. Scopel, Rodolfo A. Sánchez and Steven R. Radosevich	777	Photomorphogenic processes in the agricultural environment

Sharman D. O'Neill	789	The photoperiodic control of flowering: progress toward understanding the mechanism of induction
Wolfhart Rüdiger	803	Events in the phytochrome molecule after irradiation
Stanley J. Roux	811	Calcium-regulated nuclear enzymes: potential mediators of phytochrome-induced changes in nuclear metabolism?
Commentaries		
Harry Smith	815	The ecological functions of the phytochrome family. Clues to a transgenic programme of crop improvement
Michael J. Kasperbauer	823	Phytochrome regulation of morphogenesis in green plants: from the Beltsville Spectrograph to colored mulch in the field
Jason W. Reed, Punita Nagpal and Joanne Chory	833	Searching for phytochrome mutants
Hansjörg A. W. Schneider-Poetsch	839	Signal transduction by phytochrome: phytochromes have a module related to the transmitter modules of bacterial sensor proteins
Paul Galland	847	Forty years of blue-light research and no anniversary
Erratum	855	

VOLUME 56 NUMBER 6 DECEMBER 1992

BIOPHYSICAL CHEMISTRY OF RETINAL PROTEINS

Pill-Soon Song	VII	Editorial
Richard A. Mathies and Toshiaki Kakitani	857	Introduction and Dedication
Tôru Yoshizawa	859	The road to color vision: structure, evolution and function of chicken and gecko visual pigments
Structure and Genetics of Rhodopsins		
Shannath L. Merbs and Jeremy Nathans	869	Photobleaching difference absorption spectra of human cone pigments: quantitative analysis and comparison to other methods
Tartaneh Mirzadegan, Christine Humblet, William C. Ripka, Leticia U. Colmenares and Robert S. H. Liu	883	Modeling rhodopsin, a member of G-protein coupled receptors, by computer graphics. Interpretation of chemical shifts of fluorinated rhodopsins
Mikio Kataoka, Theodore W. Kahn, Yutaka Tsujiuchi, Donald M. Engelman and Fumio Tokunaga	895	Bacteriorhodopsin reconstituted from two individual helices and the complementary five-helix fragment is photoactive
Bioorganic Studies of Rhodopsins		
M. Groesbeek and J. Lugtenburg	903	Synthesis of doubly and multiply isotopically labeled retinals
Noriko Sekiya, Akio Kishigami, Fumio Tokiunaga, Tetsuo Takahashi and Kazuo Yoshihara	909	Structural study of retinochrome using fluorinated analogue chromophores
Masayoshi Ito, Yuko Katsata, Yasushi Imamoto, Yoshinori Shichida and Tôru Yoshizawa	915	Conformational analysis of the rhodopsin chromophore using bicyclic retinal analogues
Tatsuo Iwasa, Masayoshi Ito and Fumio Tokunaga	921	A novel bacteriorhodopsin analogue with conformationally 6-*s*-*cis* fixed retinals
E. Starr Hazard III, Rajni Govindjee, Thomas G. Ebrey and Rosalie K. Crouch	929	Biosynthetic incorporation of m-fluorotyrosine into bacteriorhodopsin

Primary Photochemical Processes

Jack R. Tallent, Jonathan R. Birge, Chian-Fan Zhang, Elaine Wenderholm and Robert R. Birge — 935 — Conformational energetics and excited state level ordering in 11-*cis* retinal

Stacie E. Wallace-Williams, Søren Møller, Kerry M. Hanson, Robert A. Goldbeck, David S. Kliger and W. Atom Yee — 953 — Solvent and temperature effects on the excited singlet stat absorption of diphenylbutadiene

Srinivasan Ganapathy and Robert S. H. Liu — 959 — Photoisomerization of sixteen isomers of retinal. Initial product distribution in direct and sensitized irradiation. Photochemistry of polyenes 31

Yumiko Mukai, Takumi Imahori and Yasushi Koyama — 965 — Comparison of the pathways and quantum yields of direct photoisomerization of unprotonated and protonated *n*-butylamine Schiff bases of isomeric retinylideneacetaldehyde with those of Schiff bases of isomeric retinal: rationalization of the selection of the retinylidene chromophore by retinochrome

Toshiaki Kakitani, Yasuyo Hatano, Yoshinori Shichida, Yasushi Imamoto, Fumio Tokunaga and Hiroko Kakitani — 977 — Excited state dynamics of retinal proteins as studied by Fourier transform of optical absorption spectrum—I. Development of analytical method

Toshiaki Kakitani, Narifumi Matsuda, Yasuyo Hatano, Yoshinori Shichida and Hiroko Kakitani — 989 — Excited state dynamics of retinal proteins as studied by Fourier transform of optical absorption spectrum—II. Theoretical analysis of wavepacket propagation of rhodopsin

Toshiyuki Okano, Yoshitaka Fukada, Yoshinori Shichida and Tôru Yoshizawa — 995 — Photosensitivities of iodopsin and rhodopsins

Makoto Taiji, Krzysztof Bryl Masashi Nakagawa, Motoyuki Tsuda and Takayoshi Kobayashi — 1003 — Femtosecond studies of primary photoprocesses in octopus rhodopsin

Krzysztof Bryl, Makoto Taiji, Masayuki Yoshizawa and Takayoshi Kobayashi — 1013 — Light adaptation of dark-adapted bacteriorhodopsin studied by nanosecond time-resolved absorption spectroscopy

Spectroscopic Studies of Chromophore and Protein Structure and Kinetics

Zohreh T. Farahbakhsh, Christian Altenbach and Wayne L. Hubbell — 1019 — Spin labeled cysteines as sensors for protein–lipid interaction and conformation in rhodopsin

Steven O. Smith, Huub de Groot, Ronald Gebhard and Johan Lugtenburg — 1035 — Magic angle spinning NMR studies on the metarhodopsin II intermediate of bovine rhodopsin: evidence for an unprotonated Schiff base

S. Druckmann, N. Friedman, J. K. Lanyi, R. Needleman, M. Ottolenghi and M. Sheves — 1041 — The back photoreaction of the M intermediate in the photocycle of bacteriorhodopsin: mechanism and evidence for two M species

László Zimányi, Yi Cao, Man Chang, Baofu Ni, Richard Needleman and Janos K. Lanyi — 1049 — The two consecutive M substates in the photocycle of bacteriorhodopsin are affected specifically by the D85N and D96N residue replacements

Kazuya Fukuda and Tsutomu Kouyama — 1057 — Formation and decay kinetics of bacteriorhodopsin's N intermediate: softening the protein conformation with alcohols affects intra-protein proton transfer and retinal isomerization

Jun Sasaki, Akio Maeda, Yoshinori Shichida, Michel Groesbeek, Johan Lugtenburg and Tôru Yoshizawa — 1063 — Structure of hypsorhodopsin: analysis by Fourier transform infrared spectroscopy at 10 K

Karim Fahmy, Olaf Weidlich, Martin Engelhard, Jörg Tittor, Dieter Oesterhelt and Friedrich Siebert — 1073 — Identification of the proton acceptor of Schiff base deprotonation in bacteriorhodopsin: a Fourier-transform-infrared study of the mutant Asp85 → Glu in its natural lipid environment

Olaf Bousché, Sanjay Sonar, Mark P. Krebs, H. Gobind Khorana and Kenneth J. Rothschild — 1085 — Time-resolved Fourier transform infrared spectroscopy of the bacteriorhodopsin mutant Tyr-185 → Phe: Asp-96 reprotonates during O formation; Asp-85 and Asp-212 deprotonate during O decay

S. Hashimoto, K. Miura, T. Yamagishi, H. Takeuchi and I. Harada 1097 Ultraviolet resonance Raman study on purple and blue membranes of *Halobacterium halobium*

Maarten P. Heyn and Harald Otto 1105 Photoselection and transient linear dichroism with oriented immobilized purple membranes: evidence for motion of the C(20)-methyl group of the chromophore towards the cytoplasmic side of the membrane

Yoshitaka Beppu, Toshiaki Kakitani and Fumio Tokunaga 1113 Energetics of protonation–deprotonation of the chromophore in retinal proteins

Tetsuo Takahashi, Bing Yan and John L. Spudich 1119 Sensitivity increases in the photophobic response of *Halobacterium halobium* reconstituted with retinal analogs: a novel interpretation for the fluence–response relationship and a kinetic modeling

Yasushi Imamoto, Yoshinori Shichida, Junichi Hirayama, Naoki Kamo and Tôru Yoshizawa 1129 Nanosecond laser photolysis of phoborhodopsin from *Natronobacterium pharaonis*: appearance of KL and L intermediates in the photocycle at room temperature

Thorgeir E. Thorgeirsson, James W. Lewis, Stacie E. Wallace-Williams and David S. Kliger 1135 Photolysis of rhodopsin results in deprotonation of its retinal Schiff's base prior to formation of metarhodopsin II

Biochemistry of Retinal Pigments

Robert R. Rando 1145 Molecular mechanisms in visual pigment regeneration

Atsuko Kawata, Tadashi Oishi, Yoshitaka Fukada, Yoshinori Shichida and Tôru Yoshizawa 1157 Photoreceptor cell types in the retina of various vertebrate species: immunocytochemistry with antibodies against rhodopsin and iodopsin

Motoyuki Tsuda, Hajime Hirata and Tomoko Tsuda 1167 Interaction of rhodopsin, G-protein and kinase in octopus photoreceptors

Satoru Kawamura 1173 Light-sensitivity modulating protein in frog rods

Karl D. Olson, Padmaja Deval and John L. Spudich 1181 Absorption and photochemistry of sensory rhodopsin—I: pH effects

Corrigendum 1189